Liberia - Energy Sector

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Overview

Identification

COUNTRY
Liberia

EVALUATION TITLE
Energy Sector

EVALUATION TYPE
Independent Impact Evaluation

ID NUMBER
DDI-MCC-LIB-IE-ENERGY-2018-01

Version

VERSION DESCRIPTION
Not applicable to this evaluation; no quantitative data to be shared

Overview

ABSTRACT
In 2015, the Millennium Challenge Corporation (MCC) partnered with the Government of Liberia (GoL) to help address the country's insufficient access to reliable and affordable electricity. Under MCC's compact with the GoL, the $202 million Energy Project aims to modernize Liberia's energy network, extend access to electricity, and improve the quality and reliability of the country's power system. MCC has contracted with MPR to to conduct impact and performance evaluations of four separate activities and investments; the report outlines the proposed evaluation design of two of the activities: (1) the Mt Coffee Rehabilitation Activity, which has repaied and expanded the Mt Coffee Hydroelectric Power Plant to provide an installed generation capacity of 88MW, and (2) the Capacity Building and Sector Reform Activity, which will support the creation of an independent regulatory agency, provide management oversight to the Liberia Electricity Corporation (LEC), and strengthen the capacity of LEC.

Mathematica has proposed a comprehensive mixed method approach. Mathematica will examine outcomes at the level of overarching implementation, grid-level, energy sector, end user, and utility-level. For overarching questions, Mathematica will use interviews with key informants, site visits, and reviews of relevant documents to conduct a timeline analysis to track the implementation of Compact activities and sub-activities for its performance evaluation. For the performance analysis of grid-level, energy sector, end-user, and utility outcomes, Mathematica will draw on LEC's available administrative data for a longitudinal analysis of repeated quantitative measures, and will combined these data with qualitative data such as key informant interviews and document reviews. For the performance and impact evaluations to measure end user outcomes, Mathematica will implement a survey-based pre-post design using retrospective data on pre-intervention for previously connected households and larger energy users. Mathematica has also proposed two potential matched comparison group (MCG) designs for an implementation analysis of households which were previously unconnected to the grid: either a geographic based MCG, or a differences in differences approach.

EVALUATION METHODOLOGY
Propensity Score Matching

UNITS OF ANALYSIS
Household, community, enterprise, school, health center, administrative, public sector

KIND OF DATA
ssd, adm, cen, obs, other

TOPICS

Topic	Vocabulary	URI

Topic	Vocabulary	URI
Energy	MCC Sector	

KEYWORDS
Liberia, Energy, Grid-level, End-user, Pre-post, Mt Coffe, Mount Coffee, Renewable, Hydropower

Coverage

GEOGRAPHIC COVERAGE
Monrovia and Greater Monrovia

UNIVERSE
End users of HCHPP and LEC customers

Producers and Sponsors

PRIMARY INVESTIGATOR(S)

Name	Affiliation
Mathematica Policy Research	

FUNDING

Name	Abbreviation	Role
Millennium Challenge Corporation	MCC	

Metadata Production

METADATA PRODUCED BY

Name	Abbreviation	Affiliation	Role
Mathematica Policy Research	MPR		Independent Evaluator
Millennium Challenge Corporation	MCC		Review of Metadata

DATE OF METADATA PRODUCTION
2018-09-28

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MCC Compact and Program

COMPACT OR THRESHOLD
Liberia Compact

PROGRAM
This evaluation covers two activities: the Mount Coffee Rehabilitation and Capacity Building and Sector Reform Activities. Together with the Government of Liberia and other donors, the Mount Coffee Rehabilitation Activity, has repaired and expanded the Mount Coffee Hydropower Plant (MCHPP) in order to provide an installed generation capacity of 88 MW. The Capacity Building and Sector Reform Activity, aims to support the creation of an independent regulatory agency, provide management oversight to the Liberia Electricity Corporation (LEC), and strengthen the capacity of LEC.

MCC SECTOR
Energy (Energy)

PROGRAM LOGIC

The logic model identifies four stages: outputs, which lead to short-term outcomes, which lead to intermediate outcomes, which lead to long-term outcomes. The outputs of the Mt Coffee Rehabilitation Activity are to rehabilitate MCHPP, and to construct and rehabilitate transmission infrastructure from MCHPP to the electricity grid. The short-term outcomes of the Mt Coffee Rehabilitation Activity is increased generation and transmission capacity, specifically increased production of low-cost, renewable electricity (hydropower), improved distribution of low-cost electricity through rehabilitated substations, and hydropower accounting for an increased share of Liberia's energy consumption. The outputs of the Capacity Building and Sector Reform Project are the establishment of Liberia's energy regulatory agency, the MSC being installed with plans and activity to improve LEC's management capacity. The expected short term outcome of establishing the LERC are that it improves the energy sector's legal, economic, and technical regulation, specifically via (1) transparent registration processes, reduced electricity theft, improved predictability of sector, and an environment inviting to private investors; (2) improved tariff structure that balances lowering consumer costs, meeting LEC's operational costs, and generating revenue; and (3) improved technical regulations and oversight of providers. The expected short term outcome of installing the MSC are that LEC demonstrates improved ability to manage, operate, and expand generation and distribution infrastructure via (1) improved ability to use data for problem solving and decision making, (2) reduced frequency and duration of outages, (3) improved customer service and trust in utility, and decreased time between application and connections for new customers. The intermediate outcomes are (1) an increased number of firms, institutions, and households connected to the grid electricity; and (2) improved functionality of the energy sector. The long term outcomes are (1) increased consumption of quality electricity, (2) reduced user costs, (3) increased business productivity, (4) greater economic opportunities for households, and (5) improved capacity for public service provision. All these long term outcomes come together to support the compact goal, which is reduced poverty through economic growth.

PROGRAM PARTICIPANTS

End users, including households and entierprises, the LEC, and the LERC

Sampling

Study Population

End users of HCHPP and LEC customers

Sampling Procedure

We will conduct several studies and select seperate samples for each study. The samples will be end users of electricity including households or small, medium, or large enterprises. The samples will be located in Monrovia or Greater Monrovia along a corridor where new distribution lines will be constructed and customers connected.
• For the study of connected households and small enterprises (small end users) in Monrovia, 30 communities that have low voltage lines and connected end users were randomly selected. From these communities, a representative sample of enumeration areas (EAs) was selected. Approximately 5,000 households in these EAs were listed. At the next stage, 1,500 end users were selected including 750 households and 750 small businesses. This sample of 1,500 end users allows the evaluation to detect an increase of 7.7-9.4 kWh in consumptions, or an increase of 14.8%-18.1% from the baseline mean.
• For the study of medium and large businesses using grid electricity, we will use the utility company's list of 400-500 large end users (medium/large businesses, public institutions) as the sample to survey.
• For the impact study of unconnected end users, we will construct a matched comparison group of unconnected end users. First, we will randomly select communities with new access to low voltage distribuition lines and then randomly sample EAs within these communities. Next we will list about 30,000 potential end users in the selected EAs. From the listing, we will select a random sample of 1,500 end users that will access electricity and 1,250 matched end users that will not access electricity. We will be able to identify an MDI of 3.82-19.1 kWh, depending on the coefficient of variation.

Deviations from Sample Design

Not applicable

Weighting

Not applicable, as this report outlines the sample design

Questionnaires

Overview

Listing, community, household, enterprise, qualitative protocols for housheold, enterprise, school, health center

Data Collection

Data Collection Dates

Start	End	Cycle
2018-10-14	2018-12-31	Baseline
2020-10-01	2020-12-31	Interim
2023-10-01	2023-12-31	Final

Data Collection Notes

None, as data collection has not completed

Questionnaires

Listing, community, household, enterprise, qualitative protocols for housheold, enterprise, school, health center

Data Collectors

Name	Abbreviation	Affiliation
The Khana Group	TKG	

Supervision

The planned team composition for baseline data collection follows:

The community survey will be varried out by 2 teams of 3 enumerators and one supervisors; each enumerator will finish 2 surveys per day. The listing activity will take place in 4 teams of 5 enumerators and one supervisor; each enumerator will finish 25 surveys per day. The household survey, small business survey, and medium/large business survey will take place in 3 teams of 4 enumerators and one supervisor; each enumerator will finish 5 surveys per day.

When collecting data, the field supervisor has the primary responsibility of coordinating and supervising all survey activities including the provision of quality assurance spot checks of communities during the survey implementation period.

Field supervisors will pay regular unannounced visits to enumerators as they conduct interviews to ensure that they are engaging respondents appropriately and recording data accurately. Two types of quality control mechanism will be put in place for this study, that is interviewer accompaniment and back checks. Interviewer accompaniments will be conducted by the team supervisors and the back checks will be conducted by independent quality control (QC) officers. TKG trained QC team will be sent to the field to independently validate the data collected. For this study, TKG will deploy 2 independent QC officers, one will back the household surveys and the other will conduct back checks on the small business interviews. At a minimum, 10% of all fielded surveys must be back-checked by an independent QC staff and another 10% interviewer accompaniment must be conducted by the team supervisors.

Data Processing

Other Processing

TKG will use SurveyCTO, a CAPI program, to record responses to the survey. After data collection every day, the team supervisor will upload all interviews to a survey from which Mathematica staff will download the data. In the case of qualitative interviews, all interviews will be recorded and transcribed immediately after field work by same interviewers who conducted the interviews.

Data Appraisal

Estimates of Sampling Error

Not applicable, as this report outlines the sample design